

CLAIMS

1. A valve characteristic control apparatus for an internal combustion engine having a variable valve mechanism that is adapted to change at the least, among valve characteristics of an exhaust valve, a closing timing of the exhaust valve, the internal combustion engine being configured such that a number of injections of fuel during one engine cycle is changed, the valve characteristic control apparatus setting the closing timing to a retard side during a warming up operation of the internal combustion engine, characterized by comprising:

retard amount setting means for setting a retard amount of the closing timing during the warming up operation based on the number of injections.

2. The valve characteristic control apparatus for an internal combustion engine according to claim 1, wherein the retard amount setting means is adapted to set the retard amount such that, as the number of injections becomes fewer, the retard amount becomes smaller.

3. The valve characteristic control apparatus for an internal combustion engine according to claim 1 or 2, wherein the retard amount setting means includes a plurality of retard amount setting maps for setting the retard amount of the closing timing in accordance with the number of injections, each one of the setting maps corresponding to a respective one of the number of injections, the retard amount being set based on the respective setting maps.

4. The valve characteristic control apparatus for an internal combustion engine according to any one of claims 1 to 3, wherein the retard amount is set in accordance with an engine coolant temperature.

5. The valve characteristic control apparatus for an internal combustion engine according to any one of claims 1 to 4, wherein the retard amount is set in accordance with a degree of an engine external load.

6. The valve characteristic control apparatus for an internal combustion engine according to any one of claims 1 to 5, wherein the retard amount is set in accordance with an elapsed time from engine start up.

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7. A valve characteristic control apparatus for an internal combustion engine having a variable valve mechanism that is adapted to change at the least, among valve characteristics of an exhaust valve, a closing timing of the exhaust valve, the internal combustion engine being configured such that a number of injections of fuel during one engine cycle is changed, comprising:

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a retard amount setting portion that sets a retard amount of the closing timing during a warming up operation of the internal combustion engine based on the number of injections.

8. The valve characteristic control apparatus for an internal combustion engine according to claim 7, wherein the retard amount setting portion that sets the retard amount such that, as the number of injections becomes fewer, the retard amount becomes smaller.

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9. The valve characteristic control apparatus for an internal combustion engine according to claim 7 or 8, wherein the retard amount setting portion includes a plurality of retard amount setting maps for setting the retard amount of the closing timing in accordance with the number of injections, each one of the setting maps corresponding to a respective one of the number of injections, the retard amount being set based on the respective setting maps.

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10. The valve characteristic control apparatus for an internal combustion engine according to any one of claims 7 to 9, wherein the retard amount is set in accordance with an engine coolant temperature.

11. The valve characteristic control apparatus for an internal combustion engine according to any one of claims 7 to 10, wherein the retard amount is set in accordance with a degree of an engine external load.
- 5 12. The valve characteristic control apparatus for an internal combustion engine according to any one of claims 7 to 11, wherein the retard amount is set in accordance with an elapsed time from engine start up.